

Remarks/Arguments

Applicant respectfully requests further examination and reconsideration in view of the above amendments and arguments set forth fully below. Claims 1-127 were previously pending in the present application. Claims 45-127 were previously withdrawn. By the above amendments, Claims 1, 13, and 29-32 are amended, and Claims 2, 3, 6, 7, 28, and 34 are canceled. Accordingly, Claims 1, 4, 5, 8-27, 29-33, and 35-127 are currently pending in this application.

In the previous Response to Restriction Requirement, the Applicant contended that the interface layer of Figures 3A-3B can be a porous structure. Page 22, lines 19-22 of the specification was cited to support this contention. On pages 2-3 of the current Office Action, the Examiner responds that this particular embodiment “may have either the microchannel wall 110 or a ‘micro-porous structure, such as sintered metal and silicon foam.’” The Examiner further states on page 4 that the interface layer of Figures 3A-3B and the alternative interface of a ‘micro-porous structure, such as sintered metal and silicon foam’ as disclosed on page 22, line 19 of the specification are mutually exclusive. The Applicant disagrees with the Examiner’s conclusion and maintains that the interface layer of Figures 3A-3B and the alternative micro-porous structure are not mutually exclusive. The cited portion of the specification, page 22, lines 19-22, clearly states:

“It is also apparent that any other features, besides microchannel walls 110 are also contemplated, including, but not limited to roughed surfaces and a micro-porous structure, such as sintered metal and silicon foam. However, for exemplary purposes, the parallel microchannel walls 110 shown in Figure 3B is used to describe the interface layer 102 in the present invention.” (Emphasis added)

According to the Merriam-Webster dictionary, the word “besides” includes the meaning “together with <for example: a decision that, besides being practical, is morally right>” Clearly, the specification supports microchannel walls and/or other features, including the micro-porous structure.

Rejections under 35 U.S.C. §112

Within the Office Action, Claims 28-32 and 34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement because the claims contain subject matter which is not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention.

Specifically, the Examiner states that in the Claim 28, the limitation “intermediate conducting layer is made of a porous microstructure” is not supported within the specification. By the above amendments, the subject matter of the Claim 28 is added to the independent Claim 1. Additionally, the subject matter of the Claim 28 is changed from “the intermediate conducting layer is made of a porous microstructure” to “the heat exchanging layer is made of a porous microstructure.” Support for this limitation is found on page 22, lines 19-22 of the specification.

Each of the Claims 29-32 dependent on the Claim 28 are now dependent on the independent Claim 1 including the amended claim limitation “the heat exchanging layer is made of a porous microstructure.” Each of the Claims 29-32 is directed to the porous microstructure, which is now properly supported, as described above. Accordingly, each of the Claims 29-32 does comply with the written description requirement, and as such, the rejection under 35 U.S.C. 112, first paragraph should be removed.

By the above amendments, Claim 34 is canceled.

Rejections under 35 U.S.C. §102 and §103

Within the Office Action, Claims 1, 2, 3, 6, 7, 8, 13, 14, 16, 17, 19, and 33-37 stand rejected under 35 U.S.C. 102(b) as being anticipated by, or, in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent No. 4,758,926 to Herrell et al. (hereafter “Herrell”). The Applicant respectfully traverses this rejection for at least the following reasons.

The amended independent Claim 1 is amended to include the “porous micro-structure” limitation” previously claimed in the now canceled dependent Claim 28. Specifically, the amended independent Claim 1 includes the limitation “the heat exchanging layer includes a porous microstructure disposed thereon.”

Herrell teaches a package for cooling and protecting semiconductor integrated circuit chips. The package includes a heat sink assembly 12 coupled to a substrate assembly 24 that includes heat generating integrated circuit chips 36. The heat sink assembly 12 includes a silicon layer 40 configured with microchannels 42 to receive cooling fluid therethrough. The layer 40 and an additional silicon layer 46 are configured as manifolds for providing the cooling fluid

from a fluid inlet 14 to the microchannels 42. There is no hint, teaching, or suggestion within Herrell as to a porous microstructure used in the heat sink assembly 12. The Examiner as much as acknowledges this fact by the inclusion of the O'Neill reference for teaching a porous intermediate structure. Since Herrell does not teach a porous microstructure as claimed, the amended independent Claim 1 is allowable over Herrell.

Claims 2, 3, 6, 7, 8, 13, 14, 16, 17, 19, and 33-37 depend on the independent Claim 1. As Claim 1 is allowable over Herrell, each of the dependent Claims 2, 3, 6, 7, 8, 13, 14, 16, 17, 19, and 33-37 are also allowable over Herrell.

Within the Office Action, Claims 28-32 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Herrel as applied to Claim 1 above, and further in view of U.S. Patent No. 4,896,719 to O'Neill et al. (hereafter "O'Neill") and U.S. Patent No. 6,680,044 to Tonkovich. The Applicant respectfully traverses this rejection for at least the following reasons.

The subject matter of Claim 28 is amended and now included within the independent Claim 1. Claim 1 is further amended to include the limitation "the fluid is distributed such that at least one interface hot spot region in the hot source is selectively cooled."

O'Neill teaches a plenum 10 in combination with a heat exchanging panel 14 having a number of spaced orifices 18, 20, and a panel structure 12, 17, 28. A conduit 16 provides a fluid into the panel structure. The fluid is forced into the heat exchanging panel 14 through orifices 18, and out of the heat exchanging panel 14 through orifices 20. The fluid is output from the plenum 10 via tubes 23.

The heat exchanging panel 14 includes an expanded foam material 25 and a metal skin 15. The input orifices 18 are evenly spaced to uniformly distribute the fluid within the expanded foam material 25, thereby uniformly distributing the fluid across a metal skin 15 coupled to the foam material 25 (O'Neill, Figure 1; col. 2, lines 25-28). A baffle 34 is placed within the panel structure 12, 17, 28, to spread out the input fluid (O'Neill, col. 3, lines 35-42).

O'Neill discloses a device that uniformly cools a heat exchanging surface. There is no hint, teaching, or suggestion within O'Neill as to selectively distributing the fluid to specific hot spots on the heat exchanging surface. As such, O'Neill does not teach distributing the fluid such that at least one interface hot spot region in a hot source coupled to the heat exchanging surface is selectively cooled.

The package of Herrell is also configured to uniformly cool each integrated circuit chip 36. Specifically, the microchannels 42 are uniformly distributed across the face of the chip 36

(Herrell, Figures 3, 5, 6), and the fluid is evenly distributed to all of the microchannels 42. As such, Herrell does not teach distributing the fluid such that at least one interface hot spot region in a hot source coupled to the heat exchanging surface is selectively cooled.

Tonkovich is specifically cited for providing “good fluid flow.” Tonkovich does not disclose a heat exchanging system, nor does Tonkovich disclose a means for distributing a fluid such that at least one interface hot spot region in a hot source coupled to a heat exchanging surface is selectively cooled.

As neither O’Neill, Herrell, nor Tonkovich teach distributing the fluid such that at least one interface hot spot region in a hot source coupled to the heat exchanging surface is selectively cooled, the combination of O’Neill, Herrell, and Tonkovich does not teach distributing the fluid such that at least one interface hot spot region in a hot source coupled to the heat exchanging surface is selectively cooled. As such, the amended independent Claim 1, including the limitation “the fluid is distributed such that at least one interface hot spot region in the hot source is selectively cooled,” is allowable over the combination of O’Neill, Herrell, and Tonkovich.

Within the Office Action, Claims 1, 28, and 32 stand rejected under 35 U.S.C. 102(b) as being anticipated by, or, in the alternative, under 35 U.S.C. 103(a) as obvious over O’Neill. The Applicant respectfully traverses this rejection for at least the following reasons.

As described above, O’Neill does not teach distributing the fluid such that at least one interface hot spot region in a hot source coupled to the heat exchanging surface is selectively cooled. As such, the amended independent Claim 1, including the limitation “the fluid is distributed such that at least one interface hot spot region in the hot source is selectively cooled,” is allowable over O’Neill.

Within the Office Action, Claims 28-32 stand rejected under 35 U.S.C. 103(a) as being unpatentable over O’Neill as applied to Claim 1, 28, and 32 above, and further in view of Tonkovich. The Applicant respectfully traverses this rejection for at least the following reasons.

As described above, neither O’Neill nor Tonkovich teach distributing the fluid such that at least one interface hot spot region in a hot source coupled to the heat exchanging surface is selectively cooled. As such, the combination of O’Neill and Tonkovich does not teach distributing the fluid such that at least one interface hot spot region in a hot source coupled to the heat exchanging surface is selectively cooled. Therefore, the amended independent Claim 1, including the limitation “the fluid is distributed such that at least one interface hot spot region in

the hot source is selectively cooled," is allowable over the combination of O'Neill and Tonkovich.

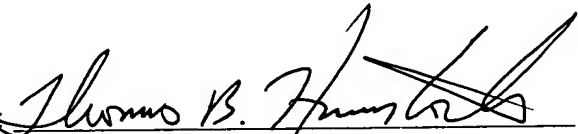
Within the Office Action, Claims 41 and 44 stand rejected under 35 U.S.C. 103(a) as being unpatentable over any of the prior art references as applied to Claim 1 above, and further in view of U.S. Patent No. 5,918,469 or International Publication WO 01/25711 A1 to Cardella. The Applicant respectfully traverses this rejection for at least the following reasons.

Claims 41 and 44 are dependent on the independent Claim 1. As described above, Claim 1 is allowable. Accordingly, Claims 41 and 44 are each also allowable as being dependent on an allowed base claim.

The Applicants respectfully request examination and reconsideration in view of the amendments above and remarks above. Following the above amendments, Claims 1, 4, 5, 8-27, and 32-127 are currently pending. Should the Examiner have any questions or comments, he or she is encouraged to call the undersigned at (408) 530-9700 to discuss the same so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
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